THE IMPACT OF ECOLOGICAL ACCOUNTING INFORMATION ON BUSINESS MANAGERS' DECISIONS

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Abstract

Ecological accounting identifies environmental impacts to determine the responsibility for environmental impacts from products and production processes. Ecological accounting information is used by managers to analyze a company's ecological strengths and weaknesses. This information system functions as a necessary control basis for the enterprise. Through ecological accounting, information about natural resources will be made transparent and the company's social responsibility requirements will be implemented in order to preserve non-exhaustible resources. Ecological accounting makes a company's environmental costs more visible through its accounting and reporting systems. The paper examines 165 enterprises in the North Central region of Vietnam. Regarding the hypothesis testing results, ecological accounting information has a significant positive impact on management decisions of enterprises in the North Central region and the relationship between ecological accounting information and management decisions in enterprises in the North Central region does not vary by business sector.

Keywords: Information, Ecological Accounting, Decisions, Managers.

1. INTRODUCTION

Over recent decades, there has been increasing interest in the role and value of natural ecosystems and how they contribute to quality of life and social well-being. The degradation and loss of ecosystem assets such as forests, grasslands, wetlands and biodiversity have raised widespread concerns about the sustainability and resilience of ecosystem services. The ability of an ecosystem to provide ecosystem services depends on the extent and condition of the ecosystem. Although humans have recognized the important role of ecosystems and their benefits to society, there is still no definitive method to measure the size and condition of ecosystems as well as changes over time and the number of services that these ecosystems provide (Vysna et al., 2021).

Through ecological accounting, information about natural resources will be made transparent and the company's social responsibility requirements will be implemented to conserve non-exhaustible resources. Ecological accounting makes the environmental costs of a company more visible through its accounting and reporting systems. The benefits and costs to the firm are then captured in the best quantitative assessment, both in monetary and physical terms. Monetary estimates can inform decision makers, such as economic policy making, cost-benefit analysis, and raising awareness of the relative importance of nature to society. Companies must reflect their environmental impacts in their accounting systems based on the requirements of ecologically sustainable development. Ecological accounting begins with the integration of ecological accounting into the company's environmental policy and the development of an appropriate accounting framework and data collection. Ecological accounting identifies environmental impacts to determine the responsibility of environmental impacts from products

and production processes. Ecological accounting information is used by managers to analyze the strengths and weaknesses of a company in terms of ecology. This information system functions as a necessary control basis of the enterprise. The article aims to assess the level of influence of ecological accounting information on management decisions of enterprises in the North Central region.

2. THEORETICAL BASIS

All decisions in business originate from the information platform. Management decisions are a reflection of the quality of accounting information processing. If the information is wrong, it will lead to wrong decisions. Therefore, complete, quality and timely information will support managers to make appropriate decisions. Accounting information meets the needs of managers in decision making and the impact of accounting information on decisions was first studied by Bruns (1968). The use of accounting information will affect investments, productivity and business value (Bushman et al., 2003). Wall & Greiling (2011), argue that accounting information is related to managerial decision making in two ways: directly as an input to decisions or indirectly to managerial actions. Managers use accounting information to make decisions serving various stakeholders mainly to support managerial decisions and accounting information is the most important input in managerial decision making (Boșoteanu, 2016). Accounting information is the information basis for decision making in a transitional economy. It helps management work more effectively (Osadchy, 2018). Due to its high certainty, relevance and reliability, accounting information is necessary and reliable information for decision makers in enterprises. Accounting plays a role in providing useful information for basic decisions at management levels (Dima, 2020). Research suggests that information plays an important role in making investment, financing, dividend and lending decisions. Providing adequate and appropriate accounting information has greatly helped managers make effective decisions, using accounting information has a significant impact and is a support measure for making management decisions (Oru, 2020). In addition, the usefulness theory also shows that providing accounting information is the process of presenting appropriate information to information users. In order to make the most appropriate decisions for the organization, managers need a lot of information from accounting to make decisions. Cholily et al. (2019) argue that the role of ecological accounting is important because it is how organizations respond and cope with environmental changes to increase their competitiveness and organizational performance. Previously, in a 2015 study, Lee et al. also pointed out the contribution of ecological accounting information in improving operational efficiency through emission reduction. Hojnik et al. (2016) studied companies in Slovenia to examine the relationship between ecological accounting and managerial performance. The results showed that ecological accounting has a positive relationship with managerial decision making, economic performance, and competitive advantage. With similar results, in a study of enterprises in China, Li (2018) also examined the relationship between ecological accounting and corporate management performance. The results of the study showed that there is a positive relationship between ecological accounting, management decisions and business performance. However, the level of ecological information in different business sectors will be different, so

the author found that the business sector is a factor affecting management decisions in enterprises with a greater or lesser need to use ecological accounting information.

Building on previous studies, the author hypothesizes:

H1: Ecological accounting information has a positive impact on management decisions in enterprises in the North Central region

H2: The relationship between ecological accounting information and management decisions in enterprises in the North Central region will vary by business sector

Based on various studies conducted previously, several variables were applied in this study to measure the impact of ecological accounting information on management decisions. Ecological accounting information was adopted as an independent variable with three observed variables (Mustafa and Sibel, 2016).

Table 1: Table describing the independent variable scale

Factors	Code	Source
Internal ecological accounting information	ST1	
External ecological accounting information	ST2	Mustafa and Sibel, 2016
Other ecological accounting information	ST3	

Managerial decision making is one of the most important features that encompasses the entire predetermined goals of the organization and takes into account whether the goals are successfully achieved or not (Tickell, 2010). Managers are expected to make wise decisions if the organization is to move forward to success. However, the quality and effectiveness of decisions made by managers depends largely on the content and quality of information provided by the systems that exist around them (Nooraie, 2011). The scale of managerial decision making was developed by (Boyd et al., 1998) by making strategic decisions; then (Rudd et al., 2008) used to study the making and implementation of managerial decisions affecting business performance. In this study, the author also inherited the scale of (Boyd et al., 1998) and (Rudd et al., 2008) used to measure the effectiveness of managerial decisions.

Table 2: Table describing the dependent variable scale

Factors	Code	Source
Long-term management decisions	QD1	
Medium-term management decisions	QD2	Boyd et al., 1998 Rudd et al., 2008
Short-term management decisions	QD3	

Thus, in this study, the relationship between ecological accounting information and management decisions in enterprises in the North Central region is moderated by the variable "Business line". The control variable (moderating variable) here is a categorical variable or a qualitative variable. The variable "Business line" is divided into 3 groups: trade (NK1), service (NK2) and production (NK3). From the theoretical model, it is identified that this is a model of intermediate variables explained by moderating variables. In the statistical model, group NK1 is used as the basis for comparison. Therefore, the arrows affecting the decision include NK2 x ST and NK3 x ST (assessing the moderating role).

3. RESEARCH MODEL

Data for the study was collected within 6 months, from February 1, 2024 to July 31, 2024. The author sent questionnaires to 250 businesses with 250 questionnaires, and received information from 165 businesses with 165 questionnaires.

The study used the probability sampling method when collecting survey data distributed directly and indirectly through personal relationships. To ensure the reliability of the collected data, the author selected respondents, including senior managers such as General Directors, Directors, Deputy Directors, and Financial Directors; middle managers such as Chief Accountants, Department Heads, Deputy Department Heads of Finance; and management accounting and general accounting experts of the enterprise. Each individual will represent the enterprise in which they are working. In the scope of the study, the author focuses on enterprises in the manufacturing, trade and service sectors.

4. RESEARCH RESULTS

4.1. Results of data transformation in moderator variable model analysis

From the original data table, transform the categorical variable NK into three dummy variables NK1, NK2 and NK3 in binary form. Choose NK1 as the basis of comparison to create two interaction variables, which are ST x NK2 and ST x NK3.

NK	NK1	NK2	NK3	ST1	ST2	ST3	QD1	QD2	QD3
2	0	1	0	2	3	3	4	2	2
1	1	0	0	3	3	2	2	2	2
2	0	1	0	1	1	1	1	1	1
1	1	0	0	2	1	1	1	1	1
3	0	0	1	2	2	2	2	2	2
2	0	1	0	1	1	1	5	1	2
3	0	0	1	1	3	2	4	1	4
2	0	1	0	3	3	3	4	2	3
2	0	1	0	3	3	3	2	2	1
3	0	0	1	3	2	2	2	2	4
2	0	1	0	2	2	2	1	1	1
1	1	0	0	1	1	1	2	1	2
2	0	1	0	2	3	3	2	3	3
1	1	0	0	2	2	2	2	1	1
1	1	0	0	2	2	2	1	2	1
2	0	1	0	3	3	2	3	3	2
2	0	1	0	3	2	3	2	2	3
3	0	0	1	2	1	1	1	1	1
2	0	1	0	3	3	3	3	1	3

Figure 1: Simulation of dummy variables NK1, NK2 and NK3

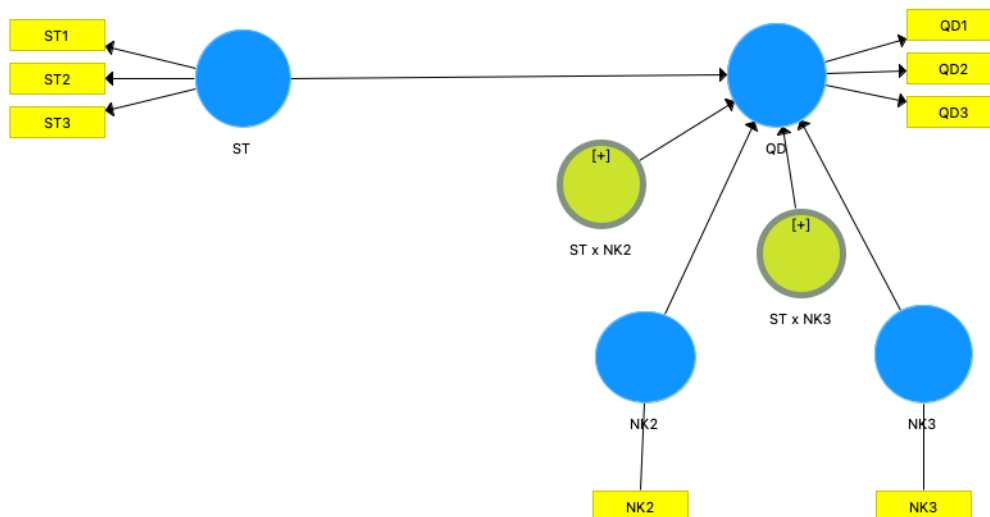**Figure 2: Path model with moderator variables**

4.2. Measurement model analysis

Composite reliability assessment

According to Hair et al. (2014), the observed variables related to quality should have an external factor loading of at least 0.7. Six observed variables have factor loadings higher than 0.7, so all six observed variables (ST1, ST2, ST3, QD1, QD2, QD3) are considered to be of high quality based on the survey findings.

Table 3: External loads

	NK2	NK3	QD	ST	ST x NK2	ST x NK3
NK2	1.000					
NK3		1.000				
QD1			0.783			
QD2			0.802			
QD3			0.895			
ST * NK2					1,058	
ST * NK3						0.951
ST1				0.775		
ST2				0.904		
ST3				0.883		

Then, the author evaluates the reliability of the scale after ensuring the quality of the observed variables. Cronbach's Alpha and Composite Reliability are two basic metrics used to evaluate the reliability of the variables of the measurement model. Many scholars, including Hair et al. (2010) and Bagozzi & Yi (1988), agree that 0.7 is a suitable evaluation criterion. In this study, ecological accounting information and management decisions both have Cronbach's Alpha and Composite Reliability values higher than 0.7. Therefore, the scales used in the study ensure validity.

Table 4: Reliability and construct validity

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
NK2	1.000	1.000	1.000	1.000
NK3	1.000	1.000	1.000	1.000
QD	0.769	0.779	**0.867**	0.686
ST	0.816	0.833	**0.891**	0.732
ST x NK2	1.000	1.000	1.000	1.000
ST x NK3	1.000	1.000	1.000	1.000

Assess the accuracy of convergence

The author uses the average variance extracted (AVE) index to assess convergence. According to Hock and Ringle (2010), if the AVE is 0.5 or greater, the scale exhibits convergent validity. Both ecological accounting information and management decisions have AVE values greater than 0.5 (Table 3). Therefore, the convergence of the variables is acknowledged.

Assess the accuracy of discrimination

To assess the discrimination level of measurement models, the author evaluated cross-loading coefficients, evaluated HTMT coefficients, and performed Bootstrap tests on HTMT coefficients.

Table 5: Cross-loading factor evaluation

	NK2	NK3	QD	ST	ST x NK2	ST x NK3
NK2	1.000	-0.512	0.011	-0.130	-0.105	0.115
NK3	-0.512	1.000	-0.070	-0.013	0.103	-0.007
QD1	-0.012	-0.091	**0.783**	0.525	-0.026	-0.068
QD2	0.067	-0.091	**0.802**	0.510	0.152	-0.177
QD3	-0.021	-0.001	**0.895**	0.612	0.113	-0.108
ST * NK2	-0.105	0.103	0.098	0.151	1.000	-0.511
ST * NK3	0.115	-0.007	-0.141	-0.196	-0.511	1.000
ST1	-0.108	0.003	0.485	**0.775**	0.119	-0.142
ST2	-0.102	-0.022	0.621	**0.904**	0.107	-0.183
ST3	-0.124	-0.012	0.593	**0.883**	0.162	-0.175

The outer loadings are all greater than the cross loadings according to Table 3. Therefore, the first step in assessing the level of discriminant validity is ensured.

Henseler et al. (2015) presented the HTMT index, stating that discriminant validity is guaranteed if the value is less than 0.9. The HTMT index of ST and QD is 0.834, as shown in Table 6. Therefore, all variables have discriminant validity.

Table 6: Evaluation of HTMT index

	NK2	NK3	QD	ST	ST x NK2	ST x NK3
NK2						
NK3	0.512					
QD	0.046	0.084				
ST	0.144	0.016	**0.834**			
ST x NK2	0.105	0.103	0.134	0.168		
ST x NK3	0.115	0.007	0.162	0.216	0.511	

Bootstrap 95% confidence interval was applied to perform the test. Observing the values of the two columns 2.5% and 97.5%, it shows that the HTMT values of ST and QD in the 95% interval are less than 1. Therefore, the analysis results conclude that the measurement indexes for ST and QD achieve a level of discrimination accuracy.

Table 7: Bootstrap test of HTMT coefficient

	Original Sample (O)	Sample Mean (M)	Bias	2.5%	97.5%
NK3 -> NK2	0.512	0.511	-0.001	0.433	0.599
QD -> NK2	0.046	0.099	0.053	0.004	0.068
QD -> NK3	0.084	0.120	0.036	0.016	0.159
ST -> NK2	0.144	0.153	0.009	0.028	0.313
ST -> NK3	0.016	0.078	0.062	0.002	0.014
ST -> QD	0.834	0.834	0.000	**0.707**	**0.933**
ST x NK2 -> NK2	0.105	0.109	0.004	0.008	0.265
ST x NK2 -> NK3	0.103	0.104	0.001	0.009	0.207
ST x NK2 -> QD	0.134	0.163	0.030	0.027	0.235
ST x NK2 -> ST	0.168	0.176	0.009	0.034	0.372
ST x NK3 -> NK2	0.115	0.116	0.001	0.011	0.229
ST x NK3 -> NK3	0.007	0.033	0.026	0.000	0.024
ST x NK3 -> QD	0.162	0.179	0.017	0.048	0.333
ST x NK3 -> ST	0.216	0.219	0.003	0.038	0.414
ST x NK3 -> ST x NK2	0.511	0.510	-0.001	0.363	0.646

4.3. Structural model analysis

According to Hair et al. (2019), the model is highly likely to have multicollinearity if the VIF is greater than or equal to 3. According to the analysis results, the obtained VIF coefficients are all less than 3, indicating that the model does not have multicollinearity.

Table 8: VIF values

	NK2	NK3	QD	ST	ST x NK2	ST x NK3
NK2			1.404			
NK3			1.385			
QD						
ST			1.064			
ST x NK2			1.378			
ST x NK3			1.397			

The results of the structural model analysis show that the P-Values of the impacts (ST -> QD) are less than 0.05, so these impacts are statistically significant. Specifically, the results of PLS-Sem confirm that ecological accounting has a positive impact on the management decisions of enterprises in the North Central region (β=0.674, P<0.050), supporting hypothesis H1.

Table 9: Hypothesis testing, R2 and f2

H1	Beta	SD	T-Value	P-Value	R Square Adjusted	f Square	Result
ST-> QD	0.674	0.048	14.008	0.000	0.453	0.780	Support

To evaluate the impact of one or more independent variables on a dependent variable in the SEM model, the author uses the adjusted R square index. The adjusted R square of QD is 0.453, so the independent variables (ST) have explained 45.3% of the variation (variance) of the QD variable. In addition, to evaluate the importance of the independent variable on the dependent variable, Cohen (1988) proposed the f square index. The f square index of ST on QD is 0.780. so this impact level is assessed as large.
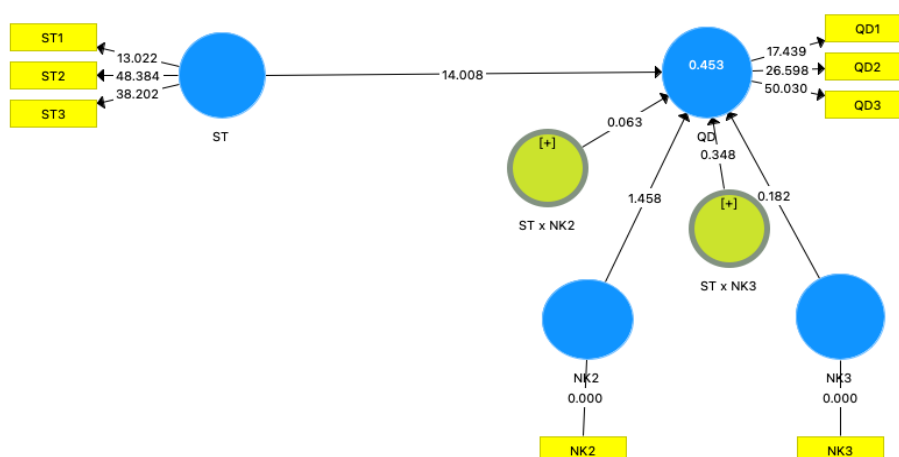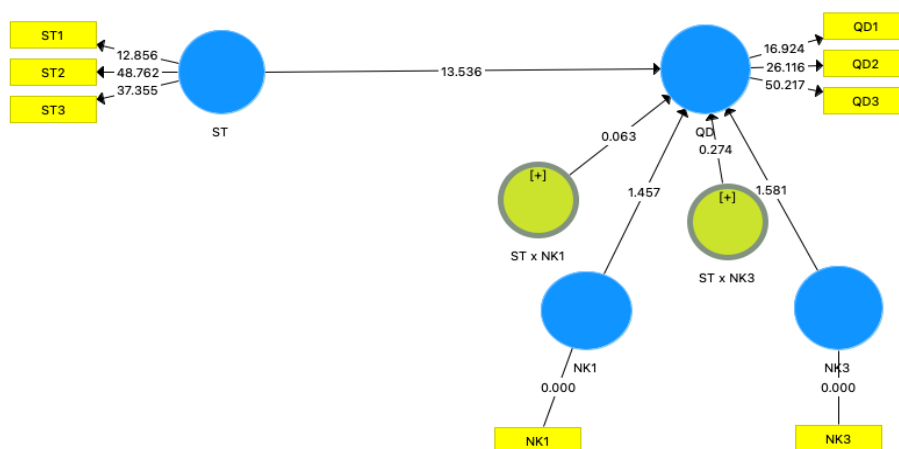

Figure 3: Path model results using NK1 as a comparison basis

Table 10: Industry differences in management decisions using NK1 as a comparison basis

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
NK2 -> QD	0.094	0.095	0.065	1.458	**0.145**
NK3 -> QD	-0.012	-0.010	0.067	0.182	**0.856**

Figure 4: Path model results using NK2 as a comparison basis

Table 11: Industry differences in management decisions using NK2 as a comparison basis

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
NK1 -> QD	-0.10	-0.10	0.07	1.46	**0.15**
NK3 -> QD	-0.11	-0.11	0.07	1,58	**0.11**

Assessing the difference of business industry groups to management decisions

In the case of using NK1 as the basis for comparison, the results are shown in Table 10. The P-Values result shows that there is no difference in management decisions between the NK2 and NK1 groups, and there is no difference in management decisions between the NK3 and NK1 groups.

In the case of using NK2 as the basis for comparison, the results are shown in Table 11. The P-Values result shows that there is no difference in management decisions between the NK1 and NK2 groups, and there is no difference in management decisions between the NK3 and NK2 groups.

Thus, there is no difference in management decisions between business groups.

Table 12: The relationship between ecological accounting information and management decisions in enterprises in the North Central region will vary by business sector using NK1 as the basis of comparison

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
ST x NK2 -> QD	-0.004	0.000	0.058	0.063	**0.950**
ST x NK3 -> QD	-0.023	-0.022	0.066	0.348	**0.727**

Table 13: The relationship between ecological accounting information and management decisions in enterprises in the North Central region will vary by business sector using NK2 as the basis of comparison

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
ST x NK1 -> QD	0.00	0.00	0.06	0.06	**0.95**
ST x NK3 -> QD	-0.02	-0.02	0.07	0.27	**0.78**

The relationship between ecological accounting information and management decisions in enterprises in the North Central region will change according to the business sector or not is shown in Table 12 and Table 13.

The analysis results show that P-Values are all greater than 0.05, so this relationship is not statistically significant. That is, the relationship between ecological accounting information and management decisions in enterprises in the North Central region is not affected by the business sector. Or the hypothesis H2 is rejected.

5. CONCLUSION

The research results support hypothesis H1 and reject hypothesis H2. That is, ecological accounting information has a significant positive impact on management decisions of enterprises in the North Central region. This result is consistent with previous studies by Bruns (1968), (Bushman et al., 2003), Wall & Greiling (2011), Li (2018) ... Management decisions are a reflection of the quality of accounting information processing. If the information is wrong, it will lead to wrong decisions. Therefore, complete, quality and timely information will support managers to make appropriate decisions. Ecological accounting is important because it is the way organizations react and respond to environmental changes to increase the competitiveness and performance of the organization. Ecological accounting information in improving operational efficiency through emission reduction. In the context of green economic development, combined with the specific geographical characteristics of the region, business managers in the North Central region are interested in ecological accounting information to make business decisions.

However, the research results also show that the relationship between ecological accounting information and management decisions in enterprises in the North Central region does not change according to the business sector. Whether the enterprise is a manufacturing enterprise, a service enterprise or a trading enterprise, this characteristic does not affect the use of ecological accounting information in business decision making of administrators.

Environmental issues are of concern in both economic and social life, first of all, managers of each enterprise must have an ecologically conscious business process. Business administrators must make decisions and act for the benefit of organizations and society. Enterprises are the first and most important factor in economic activities, affecting the pollution and degradation of the natural environment. To minimize its negative impacts, it is necessary to green the economy, which is considered as a set of management, technology, finance and economic measures to reduce the ecological burden on the natural environment.

Environmental performance is determined by at least three key factors: improvements in economic and environmental performance; Enhancement of environmental performance should be considered as a matter of business competitiveness; Environmental performance is a complementary and enabling principle for achieving sustainable development. Environmental performance assumes that efficiency gains occur through improvements in environmental performance. Business managers themselves need to focus on ecological accounting information, because: (1) Consumers demand more clean products that are produced without polluting the environment and are used and disposed of without causing harmful impacts on the environment; (2) Employees prefer to work for environmentally responsible companies, which leads to higher productivity; (3) Environmentally responsible companies can enjoy external benefits such as lower capital costs or lower insurance payouts; (4) Better environmental practices can bring significant social benefits such as benefits to people's health, improving the company's image and increasing the consumption of products and services; (5) Focusing on environmental practices forces management to innovate and seek new opportunities; (6) Reducing environmental costs can create a competitive advantage.

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